Estimating tsunami currents from shipborne Automatic Identification System data

*Daisuke Inazu[1], Tsuyoshi Ikeya[1], Toshio Iseki[1], Takuji Waseda[2]

1. Tokyo University of Marine Science and Technology, 2. The University of Tokyo

We explored tsunami signals in maritime Automatic Identification System (AIS) data during the 2011 Tohoku, Japan, tsunami. The AIS data include latitude/longitude in horizontal location, ship heading, and so on. We employed the horizontal locations and the heading of each ship from AIS data to calculate ship velocity components in two directions in terms of the ship heading: heading-normal and heading-parallel directions. The heading-normal velocity showed good agreement with the simulated tsunami current. However, the heading-normal velocity was contaminated by non-tsunami noises that were mostly related to the ship yaw motion around the pivot point. The noise due to the yaw motion was reasonably corrected in the heading-normal velocity. The corrected heading-normal velocity clearly showed better agreement with the simulated tsunami current. The corrected heading-normal velocity was still a ship response to the tsunami current. Based on an equation of a ship response to tsunami currents, we numerically estimated tsunami current from the corrected heading-normal velocity. We could find very slight improvements in estimating the tsunami currents, which indicated that this operation possibly worked as a secondary correction. Although the heading-parallel velocity is basically the navigation speed, and is mostly controlled by ships' captain, we could find the heading-parallel velocity was also drifted by tsunami currents.

Keywords: Automatic Identification System, Tsunami current, Ship heading